

## CLAIMS

1. An electrolyte sheet for solid oxide fuel cells comprising a sintered sheet, wherein surface roughness  
5 of the sheet as measured by an optical and laser-based non-contact three-dimensional profile measuring system is 2.0 to 20  $\mu\text{m}$  in  $R_z$  and 0.20 to 3.0  $\mu\text{m}$  in  $R_a$  on both surfaces of the sheet, and wherein a ratio of  $R_z$  of one surface (having a greater  $R_z$ ) to  $R_z$  of the other surface  
10 having a smaller  $R_z$  of the sheet ( $R_z$  ratio) is in a range of 1.0 to 3.0 and a ratio of  $R_{\text{max}}$  to  $R_z$  ( $R_{\text{max}}/R_z$  ratio) of at least one surface is in a range of 1.0 to 2.0, and wherein  $R_z$  (mean roughness depth),  $R_a$  (arithmetical mean roughness value), and  $R_{\text{max}}$  (maximum roughness  
15 depth) are roughness parameters as determined according to German Standard "DIN-4768" and are numerical values as measured for each surface of the sheet.

2. An electrolyte sheet for solid oxide fuel cells comprising a sintered sheet, wherein surface roughness  
20 of the sheet as measured by an optical and laser-based non-contact three-dimensional profile measuring system is 2.0 to 20  $\mu\text{m}$  in  $R_z$  and 0.20 to 3.0  $\mu\text{m}$  in  $R_a$  on both surfaces, and wherein a ratio of  $R_a$  of one surface (having a greater  $R_a$ ) to  $R_a$  of the other surface having a smaller  
25  $R_a$  of the sheet ( $R_a$  ratio) is in a range of 1.0 to 3.0

and a ratio of  $R_{\max}$  to  $R_z$  ( $R_{\max}/R_z$  ratio) of at least one surface is in a range of 1.0 to 2.0, and wherein  $R_z$  (mean roughness depth),  $R_a$  (arithmetical mean roughness value), and  $R_{\max}$  (maximum roughness depth) are roughness parameters as determined according to German Standard "DIN-4768" and are numerical values as measured for each surface of the sheet.

3. An electrolyte sheet for solid oxide fuel cells comprising a sintered sheet, wherein surface roughness of the sheet as measured by an optical and laser-based non-contact three-dimensional profile measuring system is 2.0 to 20  $\mu\text{m}$  in  $R_z$  and 0.20 to 3.0  $\mu\text{m}$  in  $R_a$ , and wherein a ratio of  $R_z$  of one surface (having a greater  $R_z$  and a greater  $R_a$ ) to  $R_z$  of the other surface having a smaller  $R_z$  and a smaller  $R_a$  ( $R_z$  ratio) is in a range of 1.0 to 3.0, and a ratio of  $R_a$  of one surface (having a greater  $R_z$  and a greater  $R_a$ ) to  $R_a$  of the other surface having a smaller  $R_z$  and a smaller  $R_a$  ( $R_a$  ratio) is in a range of 1.0 to 3.0, and a ratio of  $R_{\max}$  to  $R_z$  ( $R_{\max}/R_z$  ratio) of at least one surface is in a range of 1.0 to 2.0, and wherein  $R_z$  (mean roughness depth),  $R_a$  (arithmetical mean roughness value), and  $R_{\max}$  (maximum roughness depth) are roughness parameters as determined according to German Standard "DIN-4768" and are numerical values as measured for each surface of the sheet.

4. The electrolyte sheet for solid oxide fuel cells according to any of claims 1 to 3, wherein the  $R_{max}/R_z$  ratio is greater than 1.0 and not greater than 1.3.

5 5. A process for production of an electrolyte sheet for solid oxide fuel cells according to any of claims 1 to 4, comprising steps of: preparing a slurry for production of a green sheet, wherein particle size of solid components in the slurry is 0.2 to 0.8  $\mu m$  in  
10 50 vol.% diameter and 0.8 to 10  $\mu m$  in 90 vol.% diameter, and wherein particle size distribution has each one peak in a range of 0.2 to 0.8  $\mu m$  and in a range of 0.8 to 10  $\mu m$ ; preparing a green sheet, using the slurry, on a polymer film with surface roughness being in a range  
15 of 3 to 30  $\mu m$  in  $R_z$  and in a range of 0.3 to 5  $\mu m$  in  $R_a$  on a surface to be coated; and calcining the green sheet.

6. The production process according to claim 5, wherein the slurry for production of a green sheet is  
20 prepared by milling raw material powder (A) of 0.2 to 0.8  $\mu m$  in 50 vol.% diameter and of 0.8 to 10  $\mu m$  in 90 vol.% diameter, a binder, a dispersant, and a solvent, to give a slurry, to which is then added raw material powder (B) of 0.2 to 2  $\mu m$  in 50 vol.% diameter and of  
25 0.8 to 20  $\mu m$  in 90 vol.% diameter at a ratio of 1% to

30% by mass, based on the total raw material powder mass,  
and by further milling the slurry so that a ratio ( $T_B/T_A$ )  
of a milling time ( $T_B$ ) after addition of the raw material  
powder (B) to a milling time ( $T_A$ ) only for the raw material  
5 powder (A) is adjusted in a range of 1/100 to 1/2.

7. The production process according to claim 5  
or 6, wherein the green sheet is cut into a prescribed  
shape, and the cut green sheets are stacked up, while  
at least one selected from the group consisting of porous  
10 ceramic sheets, precursor green sheets of the porous  
ceramic sheets, and ceramic particles is placed as a  
spacer between the respective cut green sheets, which  
are then calcined.